

An End-To-End Microfluidic Platform for Engineering Life Supporting Microbes in Space Exploration Missions, Phase II

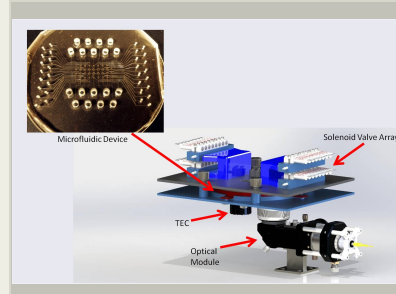
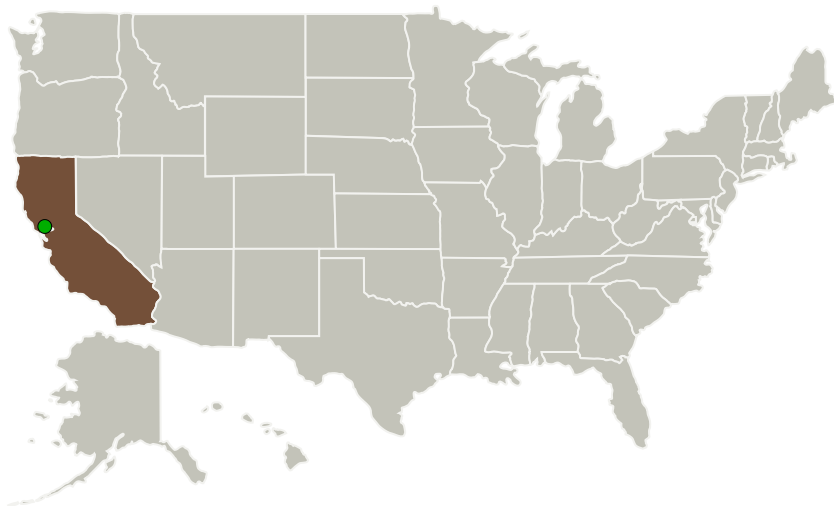
Completed Technology Project (2015 - 2018)



Project Introduction

HJ Science & Technology (HJS&T) and Lawrence Berkeley National Laboratory (LBNL) propose a highly integrated, programmable, and miniaturized microfluidic automation platform capable of running rapid and complex synthetic biology and bioengineering processes for engineering life supporting microbes in space exploration missions. Our approach combines the microfluidic automation technology of HJS&T with the novel synthetic biology technologies of 1) combinatorial gene library generation, 2) host transformation, and 3) gene product screening at LBNL and the Joint BioEnergy Institute (JBEI). In Phase I, we have established the feasibility of the proposed microfluidic automation technology by engineering and screening cyanobacterial cells for enhanced production of free fatty acids. In Phase II, we will expand the Phase I microfluidic automation capability to enable automated, metabolic engineering and screening of microbes for enhanced production of other classes of important compounds for in situ resource utilization in NASA space exploration missions: propellant fuels, biopolymers, and pharmaceuticals. We will also build and deliver a Phase II prototype. The successful development of the microfluidic automation technology with its automated and miniaturized platform will lay the groundwork for life supporting waste management and in situ resource utilization capabilities in future NASA manned space exploration missions.

Primary U.S. Work Locations and Key Partners



An End-To-End Microfluidic Platform for Engineering Life Supporting Microbes in Space Exploration Missions, Phase II Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
HJ Science & Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Berkeley, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Lawrence Berkeley National Laboratory(LBNL)	Supporting Organization	R&D Center	Berkeley, California

Primary U.S. Work Locations

California

Project Transitions

▶ **June 2015:** Project Start

✓ **June 2018:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137646>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

HJ Science & Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Erik Jensen

Co-Investigator:

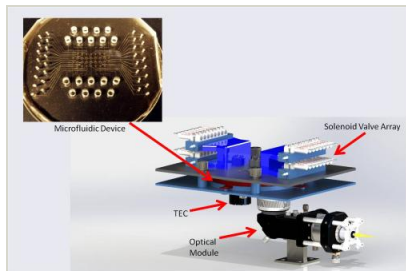
Erik M Jensen

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Images



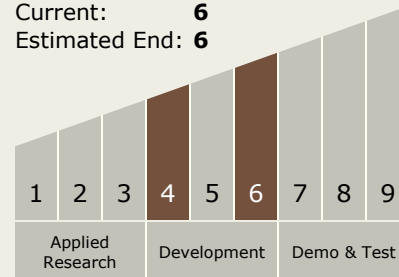
Briefing Chart Image

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(<https://techport.nasa.gov/image/132429>)

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - TX07.1 In-Situ Resource Utilization
 - TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System